

What is claimed is:

1. A food product, comprising:
  - a. microorganisms or extracted omega-3 HUFAs selected from the group consisting of Thraustochytriales, omega-3 HUFAs extracted from Thraustochytriales, and mixtures thereof; and
  - b. food material.
2. A food product, as claimed in Claim 1, wherein said food material is animal food.
3. A food product, as claimed in Claim 1, wherein said food material is human food.
4. A food product, as claimed in Claim 1, further comprising an antioxidant.
5. A food product, as claimed in Claim 1, wherein the cells of the microorganisms are lysed to increase the bioavailability of omega-3 HUFAs contained therein.
6. A food product, as claimed in Claim 1, wherein said food product is packaged under non-oxidizing conditions.
7. A food product, as claimed in Claim 1, wherein said food product is extruded.
8. A food product, as claimed in Claim 1, wherein said group further consists of Thraustochytrium, Schizochytrium, omega-3 HUFAs extracted from Thraustochytrium, omega-3 HUFAs extracted from Schizochytrium, and mixtures thereof.
9. A method of raising an animal, comprising feeding said animal microorganisms or extracted omega-3 HUFAs selected from the group consisting of Thraustochytriales, omega-3 HUFAs extracted from Thraustochytriales, and mixtures thereof in an amount effective to increase the content of omega-3 HUFAs in said animal.
10. A food product, as claimed in Claim 9, wherein said group further consists of Thraustochytrium, Schizochytrium, omega-3 HUFAs extracted from

Thraustochytrium, omega-3 HUFAs extracted from Schizochytrium, and mixtures thereof.

11. An animal raised by the method as claimed in Claim 9.

12. A food product comprising the flesh of an animal, wherein said animal is raised by the method as claimed in Claim 9.

13. A food product, comprising an egg, wherein said egg is from poultry raised by the method as claimed in Claim 9.

14. A method, as claimed in Claim 9, wherein said animal is poultry.

15. A method, as claimed in Claim 14, wherein said animal is a chicken.

16. A method, as claimed in Claim 9, wherein said animal is cattle.

17. A method, as claimed in Claim 9, wherein said animal is seafood.

18. A method, as claimed in Claim 17, wherein said seafood is selected from the group consisting of fish, shrimp, shellfish, and mixtures thereof.

19. A method, as claimed in Claim 9, wherein said animal is swine.

20. A method of producing omega-3 HUFAs, comprising culturing Thraustochytriales in a medium comprising a source of organic carbon and a source of assimilable nitrogen.

21. A method, as claimed in Claim 20, wherein said Thraustochytriales are selected from the group consisting of Thraustochytrium, Schizochytrium, and mixtures thereof.

22. A method, as claimed in Claim 21, further comprising culturing said Thraustochytrium, Schizochytrium, or mixtures thereof under nutrient-limited conditions for an effective amount of time, preferably about 6 to 24 hours.

23. A method, as claimed in Claim 20, further comprising adding to said omega-3 HUFAs or said

Thraustochytriales during post-harvest processing of said omega-3 HUFAs or said Thraustochytriales a compound selected from the group consisting of BHT, BHA, TBHQ, ethoxyquin, beta-carotene, vitamin E and vitamin C.

5 24. A method, as claimed in Claim 20, wherein said culturing step further comprises limiting the concentration in the medium of said source of assimilable nitrogen and harvesting said Thraustochytriales during said nitrogen limitation.

25. A method, as claimed in Claim 21, further comprising stressing said Thraustochytrium, Schizochytrium, or mixtures thereof with low temperatures during culturing.

26. A method, as claimed in Claim 20, further comprising maintaining a high dissolved oxygen concentration in said medium during culturing.

27. A method, as claimed in Claim 21, wherein said medium further comprises an effective amount of phosphorous to provide sustained growth of said Thraustochytrium, Schizochytrium, or mixtures thereof.

5 28. A method, as claimed in Claim 21, wherein said medium further comprises an effective amount of microbial growth factor to provide sustained growth of said Thraustochytrium, Schizochytrium, or mixtures thereof.

29. A method, as claimed in Claim 28, wherein said microbial growth factor comprises yeast extract.

30. A method, as claimed in Claim 28, wherein said microbial growth factor comprises corn steep liquor.

31. A method of producing omega-3 HUFAs, as claimed in Claim 20, further comprising extracting lipids from said Thraustochytriales.

32. A method, as claimed in Claim 31, further comprising fractional crystallization of the extracted lipids to separate omega-3 HUFAs therefrom.

33. A method, as claimed in Claim 32, wherein said fractional crystallization comprises the steps of:

a. rupturing microorganism cells to yield ruptured cells;

b. solvent extracting a lipid mixture from the ruptured cells;

5 c. hydrolyzing the lipid mixture;

d. cold-crystallizing non-HUFAS in said lipid mixture.

34. A method, as claimed in Claim 33, further comprising removing non-saponifiable compounds from said lipid mixture prior to said cold-crystallization.

35. A method, as claimed in Claim 20, wherein said carbon source and said nitrogen source comprise ground grain.

36. A method of producing omega-3 HUFAS, comprising culturing Thraustochytrium in a medium comprising ground grain.

37. A unicellular microorganism having the identifying characteristic of ATCC number 20888 and mutant strains derived therefrom.

38. A unicellular microorganism having the identifying characteristic of ATCC number 20889 and mutant strains derived therefrom.

39. A unicellular microorganism having the identifying characteristic of ATCC number 20890 and mutant strains derived therefrom.

40. A unicellular microorganism having the identifying characteristic of ATCC number 20891 and mutant strains derived therefrom.

41. A unicellular microorganism having the identifying characteristic of ATCC number 20892 and mutant strains derived therefrom.

42. A method for selecting unicellular, aquatic microorganisms capable of heterotrophic growth and capable of producing omega-3 HUFAS comprising the steps of:

5 a. selecting microorganisms of a size between about 1 $\mu$ m and 25 $\mu$ m from a sample population of microorganisms;

b. culturing said selected microorganisms in a medium comprising a source of organic carbon, assimilable nitrogen, assimilable phosphorous, and a microbial growth factor under heterotrophic conditions; and

5 c. selecting clear or white-colored non-filamentous colonies having rough or textured surfaces.

43. A method, as claimed in Claim 42, further comprising selecting orange or red-colored non-filamentous colonies having rough or textured surfaces.

44. A method, as claimed in Claim 42, wherein said sample population is collected from naturally occurring shallow saline habitats.

45. A method, as claimed in Claim 44, wherein said habitat is a saline warm spring along the Colorado River near Glenwood Springs, Colorado.

46. A method, as claimed in Claim 44, wherein said habitat is a saline warm spring on the western edge of the Stansbury Mountains, Utah.

47. A method, as claimed in Claim 44, wherein said habitat is the Tijuana estuary of San Diego County, California.

48. A method, as claimed in Claim 44, wherein said habitat is the Goshen playa near Goshen, Utah.

49. A method, as claimed in Claim 44, wherein said habitat is the marine tide pools in the Bird Rocks area of La Jolla, California.

50. A method for treating cardiovascular diseases, comprising introducing microorganisms or extracted omega-3 HUFAS selected from the group consisting of Thraustochytrium, Schizochytrium, omega-3 HUFAS  
5 extracted from Thraustochytrium, omega-3 HUFAS extracted from Schizochytrium, and mixtures thereof into a diet.

51. A method for treating inflammatory and/or immunological diseases, comprising introducing microorganisms or extracted omega-3 HUFAS selected from the group consisting of Thraustochytrium,  
5 Schizochytrium, omega-3 HUFAS extracted from

Thraustochytrium, omega-3 HUFAs extracted from  
Schizochytrium, and mixtures thereof into a diet.

52. A method for treating cancer, comprising  
introducing microorganisms or extracted omega-3 HUFAs  
selected from the group consisting of Thraustochytrium,  
Schizochytrium, omega-3 HUFAs extracted from  
5 Thraustochytrium, omega-3 HUFAs extracted from  
Schizochytrium, and mixtures thereof into a diet.